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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/815,517

04/01/2004

Hongxing Tang

CIT.PAU.47

8229

22428

7590

08/11/2006

FOLEY AND LARDNER LLP  
SUITE 500  
3000 K STREET NW  
WASHINGTON, DC 20007

EXAMINER

MILLER, ROSE MARY

ART UNIT

PAPER NUMBER

2856

DATE MAILED: 08/11/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

10/815,517

Applicant(s)

TANG ET AL.

Examiner

Rose M. Miller

Art Unit

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 21 April 2006.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-45 is/are pending in the application.
- 4a) Of the above claim(s) 2-10, 21, 25-33 and 43 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1, 11, 12, 22-24, 34, 35, 44 and 45 is/are rejected.
- 7) ☒ Claim(s) 13-20 and 36-42 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 12 August 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892) ✓
- 2) ☐ Notice of Draftperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date 1/6/06.
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_.

## DETAILED ACTION

### *Election/Restrictions*

1. The Election of Species requirement of 23 March 2006 contained a typographical error. The claims generic to all species are claims 1, 11-12, 22-24, 34-35 and 44-45. Claim 43 is not a generic claim but is the method claim equivalent to claim 21, which was not elected by Applicant. Therefore, to further the prosecution, claim 43 has been withdrawn from further consideration as being drawn to a nonelected species.

2. Claims 2-10, 21, 25-33, and 43 are withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected species, there being no allowable generic or linking claim. Election was made **without** traverse in the reply filed on 21 April 2006.

### *Claim Rejections - 35 USC § 112*

3. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

4. Claims 1, 11-20, 22, 24, 34-42, and 44 are rejected under 35 U.S.C. 112, first paragraph, because the specification, while being enabling for determining the presence or mass of a biological analytes (i.e. cantilever is biofunctionalized), does not reasonably provide enablement for utilizing the cantilever to measure acceleration, density, or viscosity or to operate an atomic force microscope (all are valid uses of the cantilever disclosed and claimed). The specification does not enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the invention commensurate in scope with these claims. Applicant's specification is specific to utilization of the disclosed cantilever in a "biofunctionalized" area whereas the claimed invention is not limited to the same area. The claimed invention pertains to any "cantilever" in any environment, which includes systems to measure viscosity, density, acceleration, or mass and which also includes the use of the cantilever in an atomic microscope.

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***Claim Rejections - 35 USC § 102***

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

6. Claims 1 and 24 are rejected under 35 U.S.C. 102(b) as being anticipated by **Lindsay (US 5,513,518)**.

**Lindsay** discloses a micromachined oscillating cantilever system comprising: a micromachined cantilever (48), a magnetic element (39) disposed on the target cantilever (48), a micromachined coil (70) disposed adjacent to the magnetic element and separated from therefrom by a predetermined gap (see column 5, lines 14-25), the coil being provided with a current which magnetically couples with the magnetic element to oscillate the target cantilever (see column 4 lines 40-50); and a transducer (laser system 58, 60) coupled to the target cantilever (48) to generate a signal in response to oscillation of the target cantilever (48).

With regards to claim 24, **Lindsay** discloses a method of oscillating a micromachined cantilever system comprising: providing a current in a micromachined coil (70) disposed adjacent to a magnetic element (39) disposed on a target cantilever (48) and separated therefrom by a predetermined gap to generate a magnetic field (see column 5, lines 14-25); coupling the magnetic field with the magnetic element; oscillating the target cantilever in response to the coupling of the magnetic field with the magnetic element (see column 5 lines 14-25) and transducing the oscillation of the target cantilever into a signal responsive to oscillation of the target cantilever (see column 4, lines 40-50).

***Claim Rejections - 35 USC § 103***

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

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8. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

9. Claims 1, 11-12, 22-24, 34-35, and 44-45 are rejected under 35 U.S.C. 103(a) as being unpatentable over **Takada (US 2002/0178831)** in view of **Meijer (US 3,638,488)**, **Roukes et al. (US 2002/0166962 A1)** and **Prater et al. (US 2002/0092340)**.

**Takada** discloses a micromachined oscillating cantilever system comprising: a micromachined target cantilever (3); a magnetic element disposed on the target cantilever (6) and a micromachined coil (7) disposed adjacent to the magnetic element (6) and separated therefrom by a predetermined gap, the coil being provided with a current which magnetically couples with the magnetic element.

**Takada** discloses the claimed invention with the exception of the coil being provided with a current that magnetically couples with the magnetic element to oscillate the target cantilever and a transducer coupled to the target cantilever to generate a signal in response to oscillation of the target cantilever.

**Meijer** teaches that an electromagnetic driver can be utilized to oscillate a sensing cantilever while **Roukes et al.** teaches the alternatives of utilizing either magnetic sensing, optical sensing, or strain sensing as the ways to measure the oscillation of a cantilever in a cantilever system and **Prater et al.** teaches utilizing optics to measure the oscillation of the cantilever.

Therefore, it would have been obvious to one of ordinary skill in the art to modify **Takada** to include the coil being provided with a current which magnetically couples with the magnetic element to oscillate the target cantilever and a transducer coupled to the target cantilever to generate a signal in response to oscillation of the target cantilever as **Meijer**, **Roukes et al.**, and **Prater et al.** teach that such modifications are known and utilized in the cantilever system art to provide the cantilever which is best suited for the environment or condition being tested for.

With regards to claim 24, **Takada** discloses the claimed invention with the exception of oscillating the target cantilever in response to the coupling of the magnetic field with the magnetic element and transducing the oscillation of the target cantilever into a signal responsive to oscillation of the target cantilever.

**Meijer** teaches that an electromagnetic driver can be utilized to oscillate a cantilever while **Roukes et al.** teaches the alternatives of utilizing either magnetic sensing, optical sensing, or strain sensing as the ways to measure the oscillation of a cantilever in a cantilever system and **Prater et al.** teaches utilizing optics to measure the oscillation of the cantilever.

Therefore, it would have been obvious to one of ordinary skill in the art to modify **Takada** to include oscillating the target cantilever in response to the coupling of the magnetic field with the magnetic element and transducing the oscillation of the target cantilever to generate a signal in response to oscillation of the target cantilever as **Meijer, Roukes et al.,** and **Prater et al.** teach that such modifications are known and utilized in the cantilever system art to provide the cantilever which is best suited for the environment or condition being tested for.

With regards to claims 11 and 34, **Takada** discloses the claimed invention with the exception of the system further comprising a microfluidic device having a microfluidic channel with a planar aspect and where the micromachined target cantilever, magnetic element, and micromachined coil are disposed in the planar aspect of the microfluidic channel.

**Prater et al.** discloses that it is known in the art of cantilever sensor systems to place the cantilever in a microfluidic device (see Figures) having a planar aspect and where the micromachined target cantilever is disposed in the planar aspect of the microfluidic channel. As for the target cantilever, magnetic element, and coil having a planar element, all of these are completely disclosed by **Takada**.

With regards to claims 12 and 35, **Takada** discloses the claimed invention with the exception of further comprising a dummy micromachined target cantilever disposed in a parallel relationship with the target cantilever and symmetrically disposed with the target cantilever relative to the micromachined coil.

**Prater et al.** teaches that the use of “dummy” or “reference” cantilevers in a cantilever sensor system is well known and utilized in the art. It would have been obvious to one of ordinary skill in the art to provide **Takada** with a dummy cantilever and to symmetrically dispose the dummy cantilever with respect to the target cantilever as **Prater et al.** teaches that the “dummy” or “reference” cantilever is utilized to eliminate the effects of changes in environmental

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parameters like "temperature, viscosity of the gas/fluid media, pH, humidity, etc." (see paragraph [0031]). With regards to this, one of ordinary skill in the art would know to place the dummy cantilever so that all other forces acting on the cantilever, including the oscillation force from the micromachined coil, is equal to that applied to the target cantilever such that the environmental factors can be eliminated from the sensed response of the cantilevers.

With regards to claims 22 and 44, **Takada** discloses the claimed invention with the exception of a plurality of target cantilevers, coils, and transducers being combined to provide cantilever systems in an array.

**Prater et al.** teaches that the utilization of cantilever arrays allows for a more diverse "biofunctionalized" sensor in that each cantilever can be utilized to detect a different substance or that the use of multiple cantilevers can be utilized to help determine the concentration of a substance. Therefore, it would have been obvious to one of ordinary skill in the art to modify **Takada** to include arrays of cantilever systems, each system including a target cantilever, magnetic element, coil, and transducer, as such would allow for more accurate sensing in that multiple substances (or directions of force) could be sensed for.

With regards to claims 23 and 45, **Takada** discloses the claimed invention with the exception of the target cantilever being biofunctionalized.

**Roukes et al.** and **Prater et al.** discloses that cantilever systems which were originally developed for use in AFM are now utilized in a wide variety of areas including the art of determining the mass or presence of a substance. When that substance is a biological substance, the cantilever is said to be "biofunctionalized" (see abstract of **Roukes et al.**). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to provide the system of **Takada** with a biofunctionalized target cantilever as both **Roukes et al.** and **Prater et al.** teach that the use of such cantilevers to determine the presence of specific substances are known in the art of cantilever systems.

#### ***Allowable Subject Matter***

10. Claims 13-20 and 36-42 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

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11. The following is a statement of reasons for the indication of allowable subject matter: The prior art of record fails to teach and/or suggest a micromachined cantilever system or method comprising, in combination with the other recited elements or steps, either the target cantilever or the dummy cantilever comprising a spring coupled to the respective cantilever about which the cantilever oscillates and where the associated transducer comprises a piezoresistive resistor coupled to the spring.

### **Conclusion**

12. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

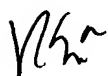
**Lange et al. (US 2002/0092359 A1)** discloses a sensor apparatus with a cantilever.

**McGill et al. (US 2005/0276726 A1)** discloses a microelectro-mechanical chemical sensor.


13. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Rose M. Miller whose telephone number is 571-272-2199. The examiner can normally be reached on Monday - Friday, 7:30 am to 3:30 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Hezron Williams can be reached on 571-272-2208. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.



RMM  
7 August 2006



DANIEL S. LARKIN  
PRIMARY EXAMINER